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PROGRESS REPORT

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ADMIRALTY EXPERIMENTAL DIVING UNIT

⑦ SCIENTIFIC AND TECHNICAL PROGRESS REPORT
MAY 1966 [55] ②

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ADMIRALTY EXPERIMENTAL DIVING UNIT

SCIENTIFIC AND TECHNICAL PROGRESS REPORT - MAY 1966

PART I - GENERAL

INTRODUCTION

1. The first half of the year was again dominated by the Deep Diving Programme, culminating in sea trials from HMS RECLAIM achieving working dives of one 1 hour duration at 600 feet. Limitations of equipment prevented proof of 800 feet dives in the sea. The need for new equipment has forced a critical review of policy and requirement in connection with Deep Diving Research and no further seaward progress can be expected until this is completed. Effort in the second half of the year was moved to other items in the Admiralty Experimental Diving Unit programme and the momentum of these is increasing. An interesting exercise in Joint Service Co-operation was conducted in the first six months of a Pilot Study of the Master Specification Authority concept. The last weeks of the year were energetically devoted to active planning with the Ministry of Public Building and Works to launch a new AEDU building proposal, urgently needed and provisionally approved in principle in 1964.

Personnel

2. Important changes in Naval staffing took place during the year. Lieutenant Commander S. A. Warner, DSC, RN, relieved Lieutenant Commander G. M. H. Drummond as Deputy Superintendent of Diving in November 1965. Commander P. A. White, MBE, RN, relieved Commander E. C. Hannen as Superintendent of Diving in January 1966 becoming the first qualified Clearance Diving Officer to hold the office. Lieutenant Commander H. Parker handed over the Admiralty Experimental Diving Team to Lieutenant Commander J. Rea, MBE, RN, in February, completing the entire turnover of Naval personnel within six months.

3. Miss M. P. Barnett, invaluable Clerical Officer for 12 years, is now pending a transfer and is at present being understudied by Mr. C. C. Rees, transferred additional on promotion from the Naval Stores Office, HMS VERNON.

4. Miss H. Unsted, Drawing Office Assistant resigned to marry and was replaced by Miss W. Williams, transferred from Bath.

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Visits and Visitors

5. Mr. S. Williams, Experimental Officer, attended the US. ONR SEALAB II trials off La Jolla, California, and Mr. R. P. Common, Chief Experimental Officer observed part of Pre-Continent III at Cap Ferat, France in October 1965.

More than 60 visitors received included:-

U.S.A.

Captain E. L. Beckman, USN
Captain R. D. Workman, USN
Commander C. H. Hedgepeth, USN
Surgeon Lieutenant E. Raymond, USN
Dr. Wallace O. Fenn, University of Rochester, N.Y. USA

Canada

Mr. R. S. Weaver, Defence Research Medical Laboratory, Toronto

Holland

Doctor F. G. A. Woudstra, R. Neth. Navy

Royal Naval visitors included:-

The Commander-in-Chief, Portsmouth, Sir Varyl Begg
The Director of Undersea Warfare (Naval) Captain R. K. W. Edden
The Director General Weapons (Naval, (Material Directorate),
Captain D. N. Callaghan
The Deputy Director General Weapons (Naval)
(Material Directorate), Captain J. Blake
The Captain, Admiralty Underwater Weapons Establishment,
Captain C. R. Sims

Meetings

6. Some 30 meetings were held in the AEDU on a variety of topics, mostly connected with projects on the programme. Another 40 meetings were attended out of the Unit. In all, about 200 man days were occupied in meetings or preparing for these.

Reports Issued

7. AEDU Report No. 32 - Review of CDBA Soda Lime Canister Test, October 1965. AEDU Report No. 33 - Underwater Ship Husbandry by Divers, November 1965. AEDU Report No. 34 - Deep Diving Trials 1963-1965, December 1965. AEDU Report No. 35 - Changing Destroyer and Frigate Propellers by Divers, January 1966.

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Unusual Diving Incidents

8. Seventeen reports of unusual incidents have been received by the AEDU in the past year. The greatest amount of work arising from these incidents stemmed from the Plymouth Emergency Deep Diving Team's experiences with unexplained failure of Surface Demand Air Supply believed due to freezing of over moist air in reducers and demand valves.

9. An extensive investigation of this equipment was carried out in the AEDU's laboratory and at the Deep Trials Unit. The work is not yet finished, although a report has been issued on progress to date.

Annual Informal Progress Meeting

10. The fourth AEDU Informal Progress Meeting was held on 25th April 1966. A Case Book was prepared for this meeting for the first time, modelled on that used in the AUWS. The re-allocation of priorities agreed at this meeting is indicated in the reports on projects.

Reporting Order

11. Project reports are grouped in Sections 2 to 5 under the general headings used in the AEDU Section of Part II of the "Buff Book" issued by the DGW(N) in September 1965.

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PART 2 - RESEARCH

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DEEP DIVING DEVELOPMENTS

Aim

12. To enable divers to carry out work in safety at depths down to 800 feet in sea water. (A.L. W.988/62 of 14.3.63).

Progress and Present Position

13. Sea trials from HMS RECLAIM in April and May occupied four members of the AEDU Research and Development staff, the Admiralty Experimental Diving Team and RN officers, plus various members of the Royal Naval Physiological Laboratory. Oxy-helium working dives were carried out at 300, 450 and 600 feet. At 600 feet, sixteen dives were done of a half or one hour duration. A number of problems were overcome, and a number of cases of decompression sickness were encountered, all of which were successfully treated without permanent injury to the subjects.

14. The incidence of decompression sickness and the limitations of Submersible Compression Chamber equipment, combined with weather problems frustrated the hope that a 800 feet dive could be attempted. Much was learned as a result of the trials. Reports have been issued.

Expected Future Trend

15. Further work ashore awaits the installation of helium supplies and recovery plant in the Deep Trials Unit. Sea trials await provision of new major equipments and probably a new deep diving ship. A policy decision on this is awaited. The evidence so far suggests that this programme will become a casualty of cost in the absence of overriding operational requirements. Priority in the AEDU programme has been downgraded in anticipation, because no ship means no sea trials.

RESEARCH AIMED ALL PROJECTS

(A) THROUGH WATER COMMUNICATION

Aim

16. To improve the safety and the efficiency of the diver.

Progress and Present Position

17. The equipment expected from Coastal Radio did not materialise due to a take-over and change of policy. The US.ANPQC-1A did not arrive until well into 1966. Since it arrived some effort has been expended

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in adaptation and conversion to render compatible with RN diving equipment. Evaluation trials are now in hand in co-operation with the AUWE diving trials team. This item is being handled by the AEDU by arrangement with the AUWE.

Expected Future Trend

18. Prior to receipt of the US equipment, thought has been given to design of a "second generation" equipment of U.K. origin, and discussions held with Messrs. C. & N. Electrical Ltd. of Gosport, toward a development contract. These proposals are held over pending completion of trials on the American set. Compatibility with RN diving equipment is likely to be a problem.

(B) DIVING DRESS RESEARCH

Aim

19. To improve the comfort, safety, and efficiency of all divers.

(i) LOW MODULUS MATERIAL

C C /

Progress and Present Position

20. A contract has been placed with the Rubber & Plastics Research Association (RAPRA) to develop a low modulus coated fabric on the lines of the specially callendered material suggested in their earlier contract concluded in 1963/64. This development will extend over several years.

(ii) CURRENT PRODUCTION

A A

Progress and Present Position

21. Some post design investigation of problems encountered by Production Inspection, and the Dunlop Rubber Co. Ltd. in manufacture of current design of underwater swimmers' dresses has taken place.

(iii) MOULDED SUITS

A A

Progress and Present Position

22. A special Fleet evaluation exercise has been mounted to try out sample production of vacuum moulded one and two piece "dry" suits made by the Dunlop Rubber Co. Ltd. from a mould developed for sales to the Royal Netherlands Navy. The two piece suits are preferred to ordinary dry suits by some men. Reports on the one piece moulded suit are awaited.

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Expected Future Trend

23. A review of requirements and policy will be carried out during the next year to decide if diversity can be accepted in the interests of convenience and efficiency, at the expense of uniformity.

(iv) UNDERWEAR

Aim

24. To improve the comfort, safety, and efficiency of all divers.

(a) FUR FABRICS

C C

25. Some useful co-operation with the Director of Victualling has taken place, and samples of several fur fabrics with two-way stretch have been made available from Borg Fabrics Ltd. The tailor making up the experimental undersuits has also interested a Midlands weaver in making a stretch fur fabric, and further suits are being made up in these materials. Stretch is now up to 40% in both "warp" and "weft" directions and it is hoped that the problems of size accuracy will now diminish.

(b) . . . SUITS OR UNDERWEAR

C C

26. Several incidents of unconsciousness due to cold conditions during the year have stimulated demand for improved insulation and/or provision of positive heating to the diver. This is a cyclic demand, formerly overcome by experienced divers by judicious use of combinations of available diving underwear to suit personal needs. It may be significant that the present casualties have all been young trainees, wearing insufficient clothing in the water. However, interest is now being shown in electrically heated suits under development by Vacuum Reflex Ltd. and E. T. Skinners & Co. Ltd. for the US Navy, and a warm water system offered by Messrs. Normalair Ltd., in case these can be of use to the RN Diving branch.

Expected Future Trend

27. Proposals for introduction of a range of nylon fur stretch undersuits will probably be made after trials of the latest production experimental garments.

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1966 1965

(v) BUOYANCY PACKS FOR WET SUITS AND DEEPER DIVING

B

Aim

28. To provide emergency buoyancy to overcome loss of displacement in wet suits at deeper depths, and for the Plymouth Emergency Deep Diving Team when diving to 200 ft. plus.

Progress and Present Position

29. Fensy and all available other life jackets have been investigated. No present jacket is suitable due to mutual interference between life jacket and breathing apparatus. Co-operation with the Life Saving Committee is being maintained.

Expected Future Trend

30. A fairly full scale investigation of all the factors must be undertaken and the solution is expected to lie in a combination of constant volume and inflatable displacement elements, suit inflation, and inflatable stole, varied according to diving equipment and operational needs.

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PART 3 - DEVELOPMENT OF SPECIFIC NEW WEAPONS AND EQUIPMENTS

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BREATHING APPARATUS DEVELOPMENTS

(1) BREATHING APPARATUS SELF CONTAINED CONVERTIBLE

P.D. A

Aim

31. To provide a diving capability to SSENs from conversion on board of DCBA.

Progress and Present Position

32. The AEDU has acquired a variety of additional responsibilities for designing equipment and manufacturing some items for these ships during the year, including BIBS modifications, adaptors to H.I.S. outlets, modifications to air dryers on board, and making up hoses and couplings for trials and training.

33. Co-ordination of various aspects has been improved and the diving equipment project has been added to the Chief Polaris Executive's PMP system.

34. Trials of the High Temperature Engineers' couplings ordered in 1965 have resulted in modifications to original design in favour of diver handling ease. Problems of ship fitting and establishment of stores have been solved. The Unit has taken over procurement and preparation of some training equipment for SESTS. This item is now transferred to Post Design.

Expected Future Trend

35. A substantial programme for this project is carried over into the coming year, with further diving trials pending on equipment, as it becomes available, and possible co-operation when ships are first equipped and manned, to iron out "Post Design" problems arising on commissioning.

(11) ASSAULT SWIMMERS' BREATHING APPARATUS AND OUTFIT

C B

Aim

36. To design an outfit to allow Royal Marine swimmers to undertake offensive operations, and beach reconnaissance in the intruder role.

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PRIORITY
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Progress and Present Position

37. Successful emergence and re-entry trials with the AEDU improvised self contained mixture sets has tended to concentrate user attention on new operational possibilities, and requirements. Proposals in draft for a new or revised Staff Requirement have been circulating and are still under consideration. Meantime work at the Admiralty Materials Laboratory to produce a breathing apparatus based on the principles used in the French DC55 oxy-nitrogen breathing apparatus has been held up for want of information on set behaviour in certain critical conditions of dive.

Expected Future Trend

38. It seems likely that the present AML work on this development may cease pending clarification of Royal Marine requirements, as the new needs may by-pass those at present in process of solution. A status report is awaited from the Superintendent, AML, on this.

(iii) NEW CLEARANCE DIVERS' BREATHING APPARATUS (NEW CDBA)

B B

Aim

39. To increase the depth and duration at which Clearance Divers can operate. To improve the resistance to breathing characteristics at depth, improve communications by eliminating the mouthpiece, and make possible a surface supply of breathing gas. A depth of 360 feet for 20 minutes is a target.

Progress and Present Position

40. General exchanges with the Dunlop Rubber Co. Ltd. Aviation Division, have continued in exploration of new designs. Some variation of probable requirements has taken place and the item is moving towards either a Staff Target or Staff Requirement. A preliminary draft Staff Requirement has been prepared and will be discussed shortly.

Expected Future Trend

41. Some AEDU design effort is expected to be devoted to this item in the coming months to clarify basic design concepts for the project.

(iv) NEW COMPRESSED AIR BREATHING APPARATUS

A C

Aim

42. To reduce weight and bulk of the Swimmers' Air Breathing Apparatus and reduce skilled maintenance required.

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Progress and Present Position

43. The draft Staff Requirement No. 7701 has now been approved expenditure within delegated authority on development of a new design of Swimmers' Air Breathing Apparatus to combine the best features of SABA with the most desirable characteristics of commercial gear while retaining the essential reliability and safety features required for service use.

Expected Future Trend

44. Much work towards the new design has already been done in the research phase, and it is not expected that the development stages will be long drawn out.

45. Proposals under consideration for modifying present SABA to reduce its weight will be progressed as by-products of the design effort on the new equipment.

(v) SEA AIR RESCUE DIVERS BREATHING APPARATUS

B

Aim

46. To provide an acceptable breathing apparatus for use by divers specialising in leaping from S.A.R. Helicopters to rescue aircrew from "ditched" aircraft etc.

Progress and Present Position

47. A Staff Requirement for this item has just been approved and work will commence as soon as agreed characteristics have been examined, using existing parts of other breathing apparatus as far as possible. The item is an urgent requirement as existing interim commercial equipment is obsolete, is out of production, and replacements cannot be obtained.

Expected Future Trend

48. A satisfactory set design is expected to be available by mid-1967.

(vi) IMPROVEMENT TO SURFACE DEMAND DIVING EQUIPMENT
(CONTROL PANEL "HIGH-FLOW")

Aim

49. To enable emergency deep diving teams to operate at depths in excess of 200 feet.

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Progress and Present Position

50. Modification work on the special SDDE panel used by the Plymouth Emergency Deep Diving Team and the addition of a prototype portable filter/dryer unit appears to have overcome the troubles experienced in 1964/65. Post design action is expected to incorporate latest modifications into new production of Mark II panels. Evidence in support of the use of oxy/helium mixtures in depths exceeding 180 feet continues to accumulate. The draft Staff Requirement for a new CDBA includes requirements and characteristics to enable the required Oxy-helium mixtures combined with a surface supply phase to be built into the new equipment for use in deeper than normal diving.

Expected Future Trend

51. Some trials with a reconditioned experimental recirculation/injector set produced some years ago are programmed for later in the year, to obtain further experience with oxy-helium mixtures. This work will contribute to knowledge required for several projects.

SURFACE DECOMPRESSION TECHNIQUES AND COMPRESSION CHAMBER DEVELOPMENTS

(i) ONE MAN COMPRESSION CHAMBERS

A C

Aim

52. To design and produce a lightweight portable one man chamber, with the capability of allowing transfer under pressure to a larger chamber. (Staff Requirement USW.60/62).

Progress and Present Position

53. A preliminary meeting has taken place with Messrs. Gloster (SARO) Ltd. in Anglesey, to consider various proposals of the firm for adaptation of the present RN one-man chamber to take a transfer-under-pressure attachment for use with a multi-compartment treatment chamber.

54. Proposals involving a smaller, lighter, and cheaper chamber developed independently by Messrs. Gloster (SARO) Ltd. are also being considered.

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Expected Future Trend

55. Urgent action to obtain transfer-under-pressure from small to larger chambers will be required in the near future. Long term consideration of the G.R.P. prospects is still proceeding. This is a likely need for chambers destined for new generation Mine Countermeasure vessels where eddy-current restrictions are severe in metal chambers.

(ii) MODIFICATIONS TO COMPRESSION CHAMBERS

Aim

56. To improve comfort and efficiency of all chambers in service.

(a) SILENCING

P.D. B

Progress and Present Position

57. Significant progress on this item has been prevented by shortage of available AEDU effort and lack of commercial interest.

Expected Future Trend

58. Increased priority is expected to improve the activity on the problem in the coming year.

(b) PROVISION OF OXYGEN BREATHING SUPPLY TO 10-MAN CHAMBER

P.D. B

Progress and Present Position

59. Arrangements for oxygen breathing supply to the 10-man chamber and the supply of foam plastic condensation protection for the one-man chamber have been completed. No other work is at present in hand on this item.

Expected Future Trend

60. Work as arising in post design will be undertaken as necessary.

(c) ONE-MAN CHAMBER COMMUNICATION

B B

Progress and Present Position

61. A Staff Requirement is circulating for this item and a contract has been placed with Messrs. C. & N. Electrical Ltd. for development of a service approved system of communication for

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the present one-man chamber and suitable for use in new generation chambers and existing multi-chamber installations.

Expected Future Trend

62. Design and prototype is expected to be completed during 1966.

DIVER SHIP MAINTENANCE (formerly Underwater Ship Husbandry)

Aim

63. To increase by the use of power tools and equipment the divers' capability to undertake work on the ship's hull. To investigate and progressively remove the limits of this capability.

(1) UNDERWATER PAINTING APPLIANCE

B A

Progress and Present Position

64. Several types of paint are under trial, and several forms of applicator have been designed. Development proceeds.

(11) UNDERWATER PROPELLER CHANGE BY DIVERS

A A

Progress and Present Position

65. Trials on Battle and County Class ships completed and reports issued. Further trials on Tribal Class and Submarines are under consideration.

(111) GENERAL PURPOSE AND POWER TOOLS FOR DIVERS' SHIP MAINTENANCE

A A

Progress and Present Position

66. A tool outfit has been proposed. Conversion of a variety of pneumatic tools at present available for surface use, to underwater use is pending.

Expected Future Trend

67. Some power tools have been sent to the Far East Fleet Clearance Diving Team for field trials in operational conditions. Underwater painting is now showing some promise of success with increasing interest from industry. The outline of the proposed tool kit has been drawn up, and it is expected soon to issue sets for trial.

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CLEARANCE DIVERS OUTFITS

(i) FIELD GAS ANALYSIS EQUIPMENT

B C

Aim

68. To enable fast and accurate analysis of the oxygen content of breathing gas cylinders by relatively untrained personnel.

Progress and Present Position

69. Several attempts have been made to obtain commercial equipment which is reliable and also simple enough for use by sailors. A Stage 3 meeting has been held to consider the most favoured available instruments, and it was agreed to obtain three Servomex Type OM.150 for evaluation. NOIL has subsequently offered to provide alternative copper oxide analysis apparatus for side by side trials. This equipment is stated to be cheaper than that proposed at the Stage 3 Meeting, and easier to use. The two systems will be tried in comparison.

Expected Future Trend

70. It is intended to decide on an equipment for introduction into service during 1966.

(ii) POWER OPERATED BOOSTER PUMP

Aim

71. To provide a transportable power operated pump to enable Clearance Divers to charge the cylinders of mixture breathing apparatus from high pressure storage cylinders.

Progress and Present Position

(a) INTERIM DESIGN SILICONE LUBRICATED BOOSTER PUMP

P.D. B

72. This pump is urgently required in the Fleet. Investigation of the prototype Siebe Gorman Pump failure in use with the Plymouth Emergency Deep Diving Team has shown that the pump performed satisfactorily over a long period of consistent overwork beyond the specified work cycle. The burster disc operated in emergency conditions as planned. There is no reason to delay completion of manufacture. Issue to the Fleet is now imminent...

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73. Some small effort will be devoted to conversion design possibilities to meet recent requirements for limited working of this pump at a more rigorous work cycle.

(b) FINAL DESIGN OF LIGHTWEIGHT DIAPHRAGM BOOSTER PUMP

B B

74. A Staff Requirement for this pump in separate pump and power unit assemblies for ease of transport has been drawn up and circulated, and a specification based on the Staff Requirement Agreed Characteristics has been prepared.

Expected Future Trend

75. It is expected to place a Development Contract with one of the leading firms in the diving world during the year, to commence design of a pump to meet the Specification and Staff Requirement.

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PART 4 - GENERAL SCIENTIFIC AND SUPPORTING SERVICES

POST DESIGN WORK - ALL PROJECTS

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(i) REDUCER AP 0434/400030

A -

Aim

76. To replace proprietary reducers in Compressed Air Breathing Apparatus by one of Admiralty design, lower cost and improved performance.

Progress and Present Position

77. The reducer is in production and is in issue to the Fleet. A series of post design problems have been, and are being dealt with, mostly concerned with tolerance interferences which failed to come to light in trial order production.

78. The reducer was designed to replace the Pattern AP.0434/4012 reducer, a proprietary design used in SDDE, DCBA and SABA equipment. It can fit SDDE and DCBA without alteration, and has a conversion coverplate and pipe assembly for use with SABA. Some parts used in the first two roles are discarded for SABA use. This has given trouble in reducers made for embodiment loan issue for use on SABA. Proposals are circulating for re-patternisation of the reducer for SABA, and issue of a separately patternised conversion kit containing all the parts required to convert to SDDE and DCBA. This is thought preferable to having two virtually identical reducers with different pattern numbers.

Expected Future Trend

79. Teething troubles are expected to yield to attention.

(ii) SWIM FINS

C -

Progress and Present Position

80. A Staff Requirement for a swim fin which can be worn in bare feet or with the foam neoprene boots of the wet suit has been drafted.

Expected Future Trend

81. It is expected to offer the Cressi "Swallow" fin, at present in use in the Far East by special arrangement, as the solution to the requirement.

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(iii) WET SUITS

C A

Aim

82. To assess the value of cellular rubber and plastic diving suits for service use.

Progress and Present Position

83. The AEDU recommended design of suit has now entered Stage IV, subject to post design effort to achieve a non-magnetic version of certain parts. Special local purchase authority was given for the Far East Fleet to equip with wet suits, and production procedure in the U.K. is moving according to plan.

Expected Future Trend

84. Later introduction of non-magnetic fittings on suits to permit universal use of these where climatic conditions dictate this course.

(iv) LADDER FOR USE WITH FLEET WORK BOATS

C -

Aim

85. To enable divers, with swim fins and comparatively heavy breathing apparatus, to climb easily into ships' boats.

Progress and Present Position

86. Production of the ladder assembly is progressing normally. Problems in design of "Universal" heads for attachment to different types of small boats have proved intractable. The AEDU's experience with ships' work boats on Fleet elements and in Portsmouth Dockyard shows great lack of uniformity in detail which is in contradiction to Ship Department drawings of standardised work boats in Fleet use. AEDU proposals for "Do-it-yourself" head attachments have been submitted and are at present being circulated.

Expected Future Trend

87. Subject to the DW Mat (N)'s decisions, Introductory DCI will be issued with sketches for ships' staff ladder head improvisation to ships' boats, or the AEDU will produce nominal head designs for each class of work boat to the DGS's gunwhale drawings, ignoring possibility of local variations.

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(v) UNDERWATER LIGHTING (QUARTZ IODINE LAMP)

C -

Aim

88. To provide divers with a light of minimum bulk, maximum penetration and minimum back scatter.

Progress and Present Position

89. Evaluation of this item is completed as far as the AEDU is concerned, and a request has been passed to the DGS for introduction of the Quartz Iodine Lamp as a patternised alternative to the present low voltage filament lamp. There may be some small technical problems to be resolved before this is possible. The lamp is greatly favoured by the user, and the manufacturer (General Electric Co.) is prepared to change the envelope dimensions to enable this to fit the present low voltage lampholder.

Expected Future Trend

90. The mechanics of introduction to service are in the field of the DGS as Design Authority.

(vi) SWIM BOARD

C -

Aim

91. To locate small items of divers/swimmers' equipment (e.g. wrist watch, compass, depth gauge) in one convenient position for easy reference, and also provide means of leaving magnetically unsafe items at safe distance from mines during mine hunting disposal operations.

Progress and Present Position

92. Further trials with experimental swimboards have been carried out and ideas for the final form are crystalising. A Staff Requirement has been drafted and circulated, but the latest thought is that this item can be improvised by the user and can be met by a paragraph in the Diving Manual BR.155.

Expected Future Trend

93. This item is expected to leave the programme when the handbook amendment has been issued.

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(vii) WRIST WATCHES

C -

Aim

94. To rationalise and specify watches for use by divers.

Progress and Present Position

95. Response to enquiries regarding in-service histories of returned watches found magnetised shows several cases of relatively normal exposure to strong permanent magnet fields. With the advent of a swim board to carry a watch, compass and depth gauge the need for a super non-magnetic watch will become less important. A meeting with the Hydrographer's representative is being held in May 1966 to try and rationalise the watch requirement.

Expected Future Trend

96. It is expected to settle for a good quality diving watch without putting excessive emphasis on completely non-magnetic characteristics. Final safety will be ensured by drill and swimboard, watches never being taken close to mines.

(viii) DIVERS' HEAD LAMP

A -

Aim

97. To replace sea cell assembly by dry cell battery case for training purposes to save £20,000 p.a. replacement cost for the Director of Stores (Naval).

Progress and Present Position

98. A battery case to use three cells (pending codification) has been designed and proved acceptable. Action to introduce this into service is in hand.

Expected Future Trend

99. It is possible that the small penalty in size and weight may be acceptable for general use in lieu of sea cells, except when long term shelf life is of overall importance.

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(1x) HIGH PRESSURE GAS CYLINDERS

A A

Aim

100. To meet unresolved problems arising in valving and maintenance of cylinders, and to improve protection in service life of gas cylinders.

Progress and Present Position

101. The six prototype cylinders for DCBA made in a higher grade steel by Chesterfield Tubes Co. Ltd. have proved quite satisfactory so far. Three were subjected to burst at static pressure and all exceeded the required pressure. On pulsation fatigue test all were withdrawn after surviving 300,000 reversals as the plant was required for other tests. 100,000 reversals is regarded as satisfactory. Production of these cylinders to meet installation of combined DCBA/diving equipment requirements of SSBNs is in hand, so that the maximum rating of 3600 psi may be used irrespective of use in sea water. Home Office Specification O/LI's requirement of 10% corrosion allowance on wall thickness will then be met.

Expected Future Trend

102. Eventually it is aimed to replace all DCBA and SDDE cylinders by the new pattern cylinder as the old ones come out of service. Work on 150 cu.ft. aluminium alloy cylinders continues.

(x) SWIMMERS' KNIFE

A -

103. The problems which caused suspension of production have been resolved and production has resumed. New contracts will start with an improved design of knife and sheath.

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PART 5 - DEVELOPMENT AND PROVISION OF SPECIAL
RESEARCH AND DEVELOPMENT FACILITIES

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(A) NEW ADMIRALTY EXPERIMENTAL DIVING UNIT'S PREMISES

104. The proposals raised in 1964 have been progressed through preliminary to final sketch plan stages with the Ministry of Public Building and Works, the Director of Research and Development Services (Naval) and Shore Division (Naval) and have been approved as a project to be processed to detailed design by the MPBW, and construction when financial provision has been made. The schedule at present provides for building in CLASP construction to commence in December 1966 or January 1967, with occupation in the Autumn 1967.

(B) AEDU TRIALS TANK

105. The internal repaint forecast for this tank has now been completed very satisfactorily, as has the overall repainting of the tank premises. HARDE, AURE, RAE, SESTS and the Fleet Air Arm continue to utilise the tank for trials and training purposes.

(C) DEEP TRIALS UNIT

Aim

106. To provide and equip a pressure chamber research facility with both "wet" and "dry" chamber dive capability to permit shore based experimental diving and research, and performance testing or environmental proving of diving or submersible technical equipment and material to depths of 1150 feet.

Progress and Present Position

(i) GENERAL

107. Commissioned in March 1965, the Unit has now entered its third six-monthly programme. Work has covered experimental dives to check existing Decompression Tables in the Diving Manual, to progress Repetitive Diving, to increase utilisation of divers in Minehunters, and to test equipment. Two hundred and four dives have been carried out in all, with one case of minor decompression sickness occurring.

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(ii) INSTRUMENTATION

108. Instrumentation of the facility continues, to provide the best available aids to physiological investigation of diving problems.

109. Much incidental post design work has been undertaken when problems have arisen, adding to, changing, or re-designing installed equipment as necessary. Teething troubles have not, on the whole, been serious.

(iii) ERGOMETER

110. Work has proceeded on this to provide an instrument for use in the Deep Trials Unit and in physiological experiments underwater. A contract for design of work output Indicating Meter has been placed with Messrs. S. Davall & Sons Ltd. and an instrument is expected during the year.

(iv) OXY/HELIUM SUPPLY AND CONSERVATION

111. A Design Study for an Oxy/helium capability with helium recovery has been placed with Neil Designs Ltd. who have offices in Portsmouth, and information regarding required building will be passed to the MPBW soon. A meeting with the DRDS regarding plant and installation will be arranged early in the new financial year.

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ANNEX B

MEDICAL AND PHYSIOLOGICAL MATTERS

1. Since the completion of the Deep Diving Trials in the summer of 1965 the major work of the Medical Officer, AEDU has been in connection with the Deep Trials Unit.

REPETITIVE DIVE TRIALS

2. These are almost complete and an interim repetitive dive routine is ready to be tried at sea. Other trials have taken second place to this requirement.

INSTRUMENTATION FOR THE DEEP TRIALS UNIT

3. The planning of instrumentation for medical and physiological monitoring during dives is complete and the equipment ordered for initial trial, experience may, however, show the need for further equipment, particularly a gas-chromatograph for the accurate measurement of gas samples.

OTHER DUTIES

4. The preparation of lectures, visits to conferences and foreign establishments and the treatment of civilian diving accidents have taken up more time than usual during the past year while standing commitments such as boards of enquiry and naval diving incidents have been less common.

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ANNEX A

AEDU
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MASTER SPECIFICATION AUTHORITY PILOT STUDY ON DIVING EQUIPMENT

Aim

112. To investigate feasibility of MOD(N) accepting responsibility for overall specification of diving equipment for all services. (Reference: PAO SCR Paper P(65) 18 (Revised)).

Progress and Present Position

113. The first six month phase of the pilot study has been completed and the specified report has been rendered. Some difficulty was met in getting in touch with other arms but contact with the Army Department is now firm.

Expected Future Trend

114. Further co-operation to agree on common items is expected during 1966, probably in connection with a new one-man compression chamber with transfer-under-pressure capability.

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